

Exam Summary (GO Classes 2023 Mock Test 3)

Qs. Attempted: **52**
28 + 24

Correct Attempts: **37**
19 + 18

Incorrect Attempts: **15**
9 + 6

Correct Marks: **55**
19 + 36

Penalty Marks: **3**
1 + 2

Resultant Marks: **52**
18 + 34

Total Questions: **65**
30 + 35

Total Marks: **100**
30 + 70

Exam Duration: **180 Minutes**

Time Taken: **180 Minutes**

[EXAM RESPONSE](#) [EXAM STATS](#) [FEEDBACK](#)

Aptitude

Q #1 Multiple Choice Type Award: 1 Penalty: 0.33 Quantitative Aptitude

Find the value of $\sin^2 10 + \sin^2 20 + \sin^2 30 + \dots + \sin^2 80$.

- A. 1
- B. 2
- C. 3
- D. 4

[Your Answer: D](#) [Correct Answer: D](#) [Correct](#) [Discuss](#)
Q #2 Multiple Choice Type Award: 1 Penalty: 0.33 Verbal Aptitude

Dolphins are regarded as the friendliest creatures in the sea and stories of them helping drowning sailors have been common since Roman times. The more we learn about dolphins, the more we realize that their society is more complex than people previously imagined. They look after other dolphins when they are ill, care for pregnant mothers and protect the weakest in the community, as we do. Some scientists have suggested that dolphins have a language but it is much more probable that they communicate with each other without needing words. Could any of these mammals be more intelligent than man? Certainly the most common argument in favour of man's superiority over them that we can kill them more easily than they can kill us is the least satisfactory. On the contrary, the more we discover about these remarkable creatures, the less we appear superior when we destroy them.

It is clear from the passage that dolphins

- A. don't want to be with us as much as we want to be with them
- B. are proven to be less intelligent than once thought
- C. have a reputation for being friendly to humans
- D. are the most powerful creatures that live in the oceans

[Your Answer: C](#) [Correct Answer: C](#) [Correct](#) [Discuss](#)
Q #3 Multiple Choice Type Award: 1 Penalty: 0.33 Verbal Aptitude

Antonym : CALLOUS

- A. Gentle
- B. Sensitive
- C. Persuasive
- D. Caring

[Your Answer: B](#) [Correct Answer: B](#) [Correct](#) [Discuss](#)
Q #4 Multiple Choice Type Award: 1 Penalty: 0.33 Verbal Aptitude

Synonym : PHLEGMATIC

- A. practical
- B. salivary
- C. dishonest
- D. calm

Your Answer: D Correct Answer: D [Correct](#) [Discuss](#)

Q #5 Multiple Choice Type Award: 1 Penalty: 0.33 Verbal Aptitude

Choose the word which is different from the rest.

- A. Cap
- B. Turban
- C. Helmet
- D. Veil

Your Answer: D Correct Answer: D [Correct](#) [Discuss](#)

Q #6 Multiple Choice Type Award: 2 Penalty: 0.67 Quantitative Aptitude

There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest of Rs. 12,000 after 3 years at the same rate?

- A. Rs. 2160
- B. Rs. 3120
- C. Rs. 3972
- D. Rs. 6240

Your Answer: C Correct Answer: C Not Attempted [Discuss](#)

Q #7 Multiple Choice Type Award: 2 Penalty: 0.67 Quantitative Aptitude

What must be added to each term of the ratio 2 : 5 so that it may equal to 5 : 6?

- A. 65
- B. 78
- C. 13
- D. 12

Your Answer: C Correct Answer: C [Correct](#) [Discuss](#)

Q #8 Multiple Choice Type Award: 2 Penalty: 0.67 Quantitative Aptitude

Daku and Tamatar can do a piece of work in 70 and 60 days respectively. They began the work together, but Daku leaves after some days and Tamatar finished the remaining work in 47 days. After how many days did Daku leave?

- A. 14 days
- B. 16 days
- C. 18 days
- D. 7 days

Your Answer: D Correct Answer: D [Correct](#) [Discuss](#)

Q #9 Multiple Choice Type Award: 2 Penalty: 0.67 Quantitative Aptitude

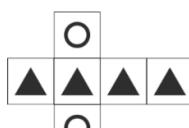
Find the greatest 6-digit number, which is a multiple of 12.

- A. 999980
- B. 999990
- C. 999984
- D. None of these

Your Answer: D Correct Answer: D [Correct](#) [Discuss](#)

Q #10 Multiple Choice Type Award: 2 Penalty: 0.67 Spatial Aptitude

Which cube cannot be made based on the unfolded cube?



- A.
- B.
- C.
- D.

Your Answer: B | Correct Answer: B | Correct | Discuss

Technical

Q #1 Multiple Choice Type Award: 1 Penalty: 0.33 Compiler Design

Which of the following three-Address code satisfies the below given expression?

$$a + b \times a + b + c + d$$

- A. $t_1 = a + b, t_2 = b \times t_1, t_3 = t_2 + c, t_4 = t_3 + d$
- B. $t_1 = a + b, t_2 = b \times t_1, t_3 = a + t_2, t_4 = t_3 + c, t_5 = t_4 + d$
- C. $t_1 = a \times b, t_2 = b \times t_1, t_3 = a + t_2, t_4 = t_3 + c, t_5 = t_4 + d$
- D. None of these

Your Answer: C | Correct Answer: D | Incorrect | Discuss

Q #2 Numerical Type Award: 1 Penalty: 0 Compiler Design

Consider the following Syntax Directed Translation Scheme -

$$\begin{aligned} F \rightarrow & L \quad \{ F.v = L.v \} \\ L \rightarrow & L_1 B \quad \{ L.l = L_1 \cdot l + 1, \\ & L.v = L_1 \cdot v + 2^{-L.l} \cdot B.v \} \\ L \rightarrow & B \quad \{ L.l=1, L.v = B.v/2 \} \\ B \rightarrow & 0 \quad \{ B.v = 0 \} \\ B \rightarrow & 1 \quad \{ B.v = 1 \} \end{aligned}$$

On input .101, what will be the final value of $F.v$ for the shift-reduce parser?

Your Answer: | Correct Answer: 0.625 | Not Attempted | Discuss

Q #3 Multiple Select Type Award: 1 Penalty: 0 Theory of Computation

Which of the following strings match the regular expression $a^*bb(ab \mid ba)^*$

- A. abb
- B. aaba
- C. abba
- D. bbaaab

Your Answer: A;D | Correct Answer: A;D | Correct | Discuss

Q #4 Multiple Choice Type Award: 1 Penalty: 0.33 Theory of Computation

$$S \rightarrow aSb \mid bSa \mid SS \mid \epsilon$$

Which of the following best characterizes the language generated by the grammar above?

- A. All strings of the form $a^i b^j a^k$, where $i + j = k$
- B. All palindromes over a and b
- C. All strings with equal numbers of a 's and b 's
- D. All strings of the form ww^R , where $w \in \{a, b\}^*$

Your Answer: C | Correct Answer: C | Correct | Discuss

Q #5 Multiple Select Type Award: 1 Penalty: 0 Mathematical Logic

Which of the following statements is/are true:

- A. If a propositional formula is valid then it is satisfiable.
- B. If a propositional formula is not valid then it is satisfiable.
- C. If a propositional formula is not valid then its negation is satisfiable.
- D. If a propositional formula is not valid, then its negation is valid.

Your Answer: A;C | Correct Answer: A;C | Correct | Discuss

Q #6 Multiple Choice Type Award: 1 Penalty: 0.33 Digital Logic

X = 01110 and Y = 11001 are two 5-bit binary numbers represented in two's complement format. The sum of X and Y represented in two's complement format using 6 bits is

- A. 100111
- B. 001000
- C. 000111
- D. 101001

Your Answer: C | Correct Answer: C | Correct | Discuss

Q #7 Numerical Type Award: 1 Penalty: 0 Combinatory

In how many ways can we choose 5 fruits from a market stall if on the stall there are: 5 apples, 5 pears and 5 apricots?

Your Answer: 3003 | Correct Answer: 21 | Incorrect | Discuss

Q #8 Multiple Choice Type Award: 1 Penalty: 0.33 Set Theory & Algebra

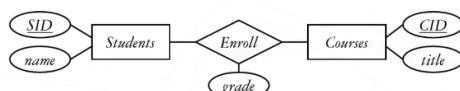
Let $U(n)$ be the set of all positive integers less than n and relatively prime to n . Then $U(n)$ is a group under multiplication modulo n . For $n = 248$, the number of elements in $U(n)$ is

- A. 60
- B. 120
- C. 180
- D. 240

Your Answer: B | Correct Answer: B | Correct | Discuss

Q #9 Multiple Select Type Award: 1 Penalty: 0 Databases

Given the E/R diagram below



Which of the following relations appear in the relational model representation of the diagram?

- A. courses(CID, title)
- B. Students(SID, name)
- C. Students(SID, name, CID)
- D. Enroll(SID, CID, grade)

Your Answer: A;C;D Correct Answer: A;B;D **Incorrect** [Discuss](#)

Q #10 [Multiple Choice Type](#) [Award: 1](#) [Penalty: 0.33](#) [Databases](#)

Codd's rule of physical data independence is that

- A. all information in the database is to be represented in one and only one way, namely by values in column positions within rows of tables.
- B. all views that are theoretically updatable must be updatable by the system.
- C. changes that are made to the physical storage representations or access methods must not require changes be made to application programs.
- D. changes that are made to tables that do not modify any of the data already stored in the tables must not require changes be made to application programs.

Your Answer: C Correct Answer: C **Correct** [Discuss](#)

Q #11 [Multiple Choice Type](#) [Award: 1](#) [Penalty: 0.33](#) [Linear Algebra](#)

Consider these 2 statements -

- S1 : If A is invertible, then A and A^{-1} have the same eigenvectors.
- S2 : If A is invertible, then A and A^{-1} have the same eigenvalues.

Which of the following is the correct option?

- A. S1 is correct but S2 is incorrect
- B. S1 is incorrect but S2 is correct
- C. Both are correct
- D. Both are incorrect

Your Answer: C Correct Answer: A **Incorrect** [Discuss](#)

Q #12 [Multiple Choice Type](#) [Award: 1](#) [Penalty: 0.33](#) [Digital Logic](#)

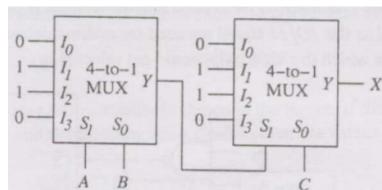
The Boolean expression $Y = \overline{A} \overline{B} \overline{C} D + \overline{A} B C \overline{D} + A \overline{B} \overline{C} D + A B \overline{C} \overline{D}$ can be minimized to

- A. $Y = \overline{A} \overline{B} \overline{C} D + \overline{A} B \overline{C} + A \overline{C} D$
- B. $Y = \overline{A} B C D + B C \overline{D} + A \overline{B} \overline{C} D$
- C. $Y = \overline{A} B C \overline{D} + \overline{B} C D + A \overline{B} \overline{C} D$
- D. $Y = \overline{A} B C \overline{D} + \overline{B} C D + A B \overline{C} \overline{D}$

Your Answer: D Correct Answer: D **Correct** [Discuss](#)

Q #13 [Multiple Choice Type](#) [Award: 1](#) [Penalty: 0.33](#) [Digital Logic](#)

In the following circuit, X is given by



- A. $X = A \overline{B} \overline{C} + \overline{A} B \overline{C} + \overline{A} \overline{B} C + A B C$
- B. $X = \overline{A} B C + A \overline{B} C + A B \overline{C} + \overline{A} \overline{B} \overline{C}$
- C. $X = A B + B C + A C$
- D. $X = A \overline{B} + \overline{B} C + A \overline{C}$

Your Answer: A Correct Answer: A **Correct** [Discuss](#)

Q #14 [Multiple Choice Type](#) [Award: 1](#) [Penalty: 0.33](#) [Probability](#)

Suppose that X is a random variable where:

$$P(X = -3) = 1/3 \quad P(X = 0) = 1/3 \quad P(X = 3) = 1/3.$$

and let $Y = X^2$.
What will be the value of $E[Y]$?

- A. 6
- B. 0
- C. $2/3$
- D. 1

Your Answer: Correct Answer: A Not Attempted Discuss

Q #15 Multiple Select Type Award: 1 Penalty: 0 Computer Networks

Consider the given statements below about TCP -

- a. Host A is sending a large file to host B over a TCP connection. Assume host B has no data to send to host A. Host B will not send acknowledgments to host A because host B cannot piggyback the acknowledgments on data.
- b. The size of the TCP $RcvWindow$ never changes throughout the duration of the connection.
- c. Suppose host A is sending a large file to host B over a TCP connection. The number of unacknowledged bytes that A sends cannot exceed the size of the advertised receiver buffer.

Which of the following statement is/are true?

- A. Only a is true
- B. a, b are true
- C. All are true
- D. Only c is true

Your Answer: D Correct Answer: D Discuss

Q #16 Multiple Select Type Award: 1 Penalty: 0 Computer Networks

ICMP time exceeded can be sent by a host when

- A. a datagram is processed and its time-to-live reaches 0 then the host discards it and notifies the sender.
- B. if reassembly timer expires before all fragments from a given datagram arrives, the destination discards the datagram and notifies the sender.
- C. the TCP timer for a message expires.
- D. all of the above

Your Answer: A;B Correct Answer: A;B Discuss

Q #17 Multiple Select Type Award: 1 Penalty: 0 Algorithms

Which of the following is/are TRUE?

- A. In the worst case, merge sort runs in $O(n^2)$ time.
- B. Depth-first search of a graph is asymptotically faster than breadth-first search.
- C. Dijkstra's algorithm is an example of a greedy algorithm.
- D. Insertion in a binary search tree is "commutative". That is, inserting x and then y into a binary search tree leaves the same tree as inserting y and then x .

Your Answer: C Correct Answer: A;C Discuss

Q #18 Multiple Choice Type Award: 1 Penalty: 0.33 DS

To delete a node X with 2 non-null children in a BST, we replace the node X with the minimum node Y from X's right subtree. Which of the following is true about the node Y?

- A. Y is always a leaf node
- B. Y is always either a leaf node or a node with empty left child
- C. Y may be an ancestor of the node
- D. Y is always either a leaf node or a node with empty right child

Your Answer: B Correct Answer: B Discuss

Q #19 Multiple Select Type Award: 1 Penalty: 0 Programming

Consider the following initialization of an array and pointer.

```
char a[] = "abc\0de";
char *p = a ;
```

Let the system is 32 bit addressable. The size of int is 4 bytes and the size of char is 1 byte.
Which of the following is/are TRUE?

- A. `sizeof(a) = 7`
- B. `sizeof(p) = 4`
- C. `sizeof(*p) = 1`
- D. `strlen(p) = 3`

Your Answer: A;C;D Correct Answer: A;B;C;D [Incorrect](#) [Discuss](#)

Q #20 [Multiple Choice Type](#) [Award: 1](#) [Penalty: 0.33](#) [Operating System](#)

Consider the following different possible pseudo-code taken from two processes, where A, B are blocks of code, and S is a semaphore initialized to 0.

Which of the following sequence ensures that A always runs BEFORE B?

Process 1: Process 2:

- A. A; up(S);
 down(S); B;

Process 1: Process 2:

- B. A; down(S);
 up(S); B;

Process 1: Process 2:

- C. down(S); down(S);
 A; B;
 up(S); up(S);

Process 1: Process 2:

- D. up(S); down(S);
 A; B;

Your Answer: B Correct Answer: B [Correct](#) [Discuss](#)

Q #21 [Numerical Type](#) [Award: 1](#) [Penalty: 0](#) [Operating System](#)

Consider a machine with a physical memory of 8 GB, a page size of 8 KB, and a page table entry size of 4 bytes. How many levels of page tables would be required to map a 46-bit virtual address space if every page table fits into a single page?

Your Answer: 2 Correct Answer: 3 [Incorrect](#) [Discuss](#)

Q #22 [Multiple Select Type](#) [Award: 1](#) [Penalty: 0](#) [Operating System](#)

Suppose that three processes exist in a system, as described table below.

Suppose that the system uses preemptive, round-robin scheduling and that T₁₁ is running when the quantum expires.

Process	Threads within the process
P ₁	T ₁₁ , T ₁₂
P ₂	T ₂₁ , T ₂₂
P ₃	T ₃₁

If the threads are implemented entirely at the user level (with no support from the operating system), which threads might possibly execute at the beginning of the next quantum?

- A. T₁₂
- B. T₂₁
- C. T₂₂
- D. T₃₁

Your Answer: B;C;D Correct Answer: B;C;D [Correct](#) [Discuss](#)

Q #23 [Numerical Type](#) [Award: 1](#) [Penalty: 0](#) [Calculus](#)

Evaluate the limit

$$\lim_{x \rightarrow \infty} (\sqrt{x+1} - \sqrt{x+2})$$

Your Answer: 0 Correct Answer: 0 [Correct](#) [Discuss](#)

Q #24 [Multiple Choice Type](#) [Award: 1](#) [Penalty: 0.33](#) [CO and Architecture](#)

Suppose that \mathbf{V} is a vector with indices from a to b and that each element of \mathbf{V} occupies two words. If the elements of \mathbf{V} are stored in consecutive words of memory and $\alpha\mathbf{V}[a]$ is the address of word 1 of $\mathbf{V}[a]$, then the address of word 1 of $\mathbf{V}[i]$, where $a \leq i \leq b$, is

- A. $(\alpha\mathbf{V}[a] - a) + i$
- B. $2(\alpha\mathbf{V}[a] - a) + 2i$
- C. $(\alpha\mathbf{V}[a] - 2a) + 2i$
- D. $(\alpha\mathbf{V}[a] - 2a) + i$

Your Answer: A Correct Answer: C [Incorrect](#) [Discuss](#)

Q #25 [Multiple Select Type](#) [Award: 1](#) [Penalty: 0](#) [Algorithms](#)

Choose all statements which are guaranteed to be true if $f = n(\sin(n) + 2)$

- A. $f = \Omega(1)$
- B. $f = \Theta(n)$
- C. $f = O(n^2)$
- D. None of the other options are true

Your Answer: D Correct Answer: A;B;C [Incorrect](#) [Discuss](#)

Q #26 [Multiple Select Type](#) [Award: 2](#) [Penalty: 0](#) [Operating System](#)

Let $\langle P_1, P_2, \dots, P_n \rangle$ be the ONLY safe state of a system. Then which of the following is/are ALWAYS true ?

- A. If P_2 is the first process to request for some resources then P_2 always have to wait.
- B. P_1 's requests will always be satisfied without even checking if resulting state (after processing P_1 's requests) is in safe state or not.
- C. Processes requests will always be satisfied in the same order as safe state sequence and we can not satisfy any out of order process request.
- D. We can never satisfy any request coming from P_n without satisfying request from P_1 .

Your Answer: B;C;D Correct Answer: B [Incorrect](#) [Discuss](#)

Q #27 [Multiple Select Type](#) [Award: 2](#) [Penalty: 0](#) [Programming](#)

Consider the following declaration of C code.

```
int (*p)[10];
```

If variable p is not initialized to any address then which of the following may give a run-time error?

- A. $(p+1)$
- B. $(p+1)[2]$
- C. $p[2]$
- D. $*p[2]$

Your Answer: B;C;D Correct Answer: D [Incorrect](#) [Discuss](#)

Q #28 [Multiple Choice Type](#) [Award: 2](#) [Penalty: 0.67](#) [Programming](#)

Consider following C code -

```
int *pi1 = (int *) malloc(2 * sizeof(int));
int *pi2 = pi1 + 1;
int i = 1;
free(pi1);
5. *(pi2 - 1) = i;
pi2 = NULL;
```

What memory management error(s) result from each code snippet?

- A. Dangling pointer but No memory leak
- B. Memory leak but No Dangling pointer
- C. Both Dangling pointer and Memory leak
- D. None

Your Answer: A | Correct Answer: A | [Correct](#) | [Discuss](#)

Q #29 | Multiple Select Type | Award: 2 | Penalty: 0 | DS

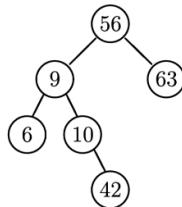
We have an AVL tree that contains the integers $1, 2, 3, \dots, 20$. We do not know what order the values were inserted into the tree. Possible values that could appear as the root.

- A. 3
- B. 5
- C. 7
- D. 16

Your Answer: B;C;D | Correct Answer: B;C;D | [Correct](#) | [Discuss](#)

Q #30 | Numerical Type | Award: 2 | Penalty: 0 | DS

Say the following tree was obtained by inserting the element 42 into an AVL tree. The tree no longer satisfies the AVL invariant, but the invariant can be re-established by performing two rotate operations.



What will be the root of tree after rotations?

Your Answer: 10 | Correct Answer: 10 | [Correct](#) | [Discuss](#)

Q #31 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

What will be the tightest bound on the worst-case time complexity of the following function sun()?

```

void sun(int n) {
    int k = 0;
    for(int i = 1; i < n; i *= 2) {
        k++;
    }
    for(int i = 0; i < n; i++) {
        if(k % 5 == 0) {
            k--;
        } else {
            for(int j = 0; j < k; j++) {
                System.out.println("let's go to the beach");
            }
        }
    }
}
  
```

- A. $O(n \log n)$
- B. $O(\log n)$
- C. $O(n^2)$
- D. $O(n^3)$

Your Answer: A | Correct Answer: A | [Correct](#) | [Discuss](#)

Q #32 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Algorithms

Consider two strings $A = "abccca"$ and $B = "abacbcba"$. Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B and let y be the number of such longest common subsequences between A and B . Then $x + 100y = \underline{\hspace{2cm}}$.

- B. 305
C. 405
D. 205

Your Answer: B Correct Answer: D Incorrect [Discuss](#)

Q #33 Multiple Choice Type Award: 2 Penalty: 0.67 [Algorithms](#)

An integer array A is **k -even-mixed** if there are exactly k even integers in A , and the odd integers in A appear in sorted order. Given a k -even-mixed array A containing n distinct integers for $k = \lceil n/\lg n \rceil$. Let $O(n^a(\log n)^b)$ be tightest bound to sort A . What will be the values of A and b ?

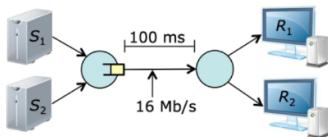
- A. $a = 1, b = 1$
B. $a = 1, b = 0$
C. $a = 0, b = 1$
D. $a = 1, b = -1$

Your Answer: Correct Answer: B Not Attempted [Discuss](#)

Q #34 Multiple Select Type Award: 2 Penalty: 0 [Computer Networks](#)

The diagram shows two TCP senders at left and the corresponding receivers at right. Both senders use TCP Tahoe. Assume that the MSS is 1 KB, that the one-way propagation delay for both connections is 100 ms and that the link joining the two routers has a bandwidth of 16 Mb/s. Let $cwnd_1$ and $cwnd_2$ be the values of the senders' congestion windows.

Please note that TCP Tahoe goes to slowstart on triple duplicate ACK or timeout. It sets threshold to $\frac{cwnd}{2}$ and cwnd to 1



Assume that the link buffer overflows whenever $cwnd_1 + cwnd_2 \geq 600$ KB. Buffer overflow is a situation of packet loss.

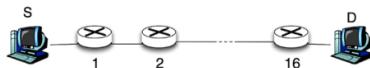
Let Initially both S_1 and S_2 are in slow start with $cwnd_1 = 250$ KB and $cwnd_2 = 50$ KB.
After 20 RTTs, approximately what are the values of $cwnd_1$ and $cwnd_2$?

- A. $cwnd_1$ is about 261 KB $cwnd_2$ is about 63 KB
B. $cwnd_1$ is about 266 KB $cwnd_2$ is about 64 KB
C. $cwnd_1$ is about 262 KB $cwnd_2$ is about 64 KB
D. $cwnd_1$ is about 266 KB $cwnd_2$ is about 66 KB

Your Answer: Correct Answer: A Not Attempted [Discuss](#)

Q #35 Multiple Choice Type Award: 2 Penalty: 0.67 [Computer Networks](#)

In the following network, node S transmits packets that pass through a tandem network of 16 routers, and arrive at the destination D. The bit rate of all links is $R = 1$ Mbit/sec. The maximum packet size in the network is 500 Bytes. Ignore the header size. The one-way propagation delay on each link is 10 msec. Assume that there is no error in transmission in the network, and the size of ACK packets is negligible.



How long does it take to transmit a file of size 50,000 Bytes if S and D use Stop-and-Wait ARQ?

- A. 23.8 seconds
B. 40.8 Seconds
C. 36.7 seconds
D. 7.53 seconds

Your Answer: D Correct Answer: B Incorrect [Discuss](#)

Q #36 Multiple Select Type Award: 2 Penalty: 0 [Computer Networks](#)

Suppose the 4000 -byte IP packet run into a link of MTU = 1500 bytes first and then a link of MTU = 900 bytes next. What is TRUE about fragments sent out on the MTU = 900 bytes link?

- A. All Fragments has same ID number
- B. There will be total 6 fragments
- C. Offset of last fragment will be 3840
- D. Total length of first, third and fifth fragments are same

Your Answer: A;B;D Correct Answer: A;B;D [Correct](#) [Discuss](#)

Q #37 [Multiple Select Type](#) [Award: 2](#) [Penalty: 0](#) [Linear Algebra](#)

Let A be an $n \times n$ matrix with characteristic polynomial

$$p(\lambda) = \lambda(\lambda - 2)(\lambda - 3)^2.$$

Which of the following can you determine from this information?

- A. The number n .
- B. The trace of A .
- C. The determinant of A .
- D. The rank of A .

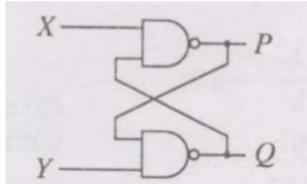
Your Answer: A;B;C;D Correct Answer: A;B;C;D [Correct](#) [Discuss](#)

Q #38 [Multiple Choice Type](#) [Award: 2](#) [Penalty: 0.67](#) [Digital Logic](#)

The following binary values were applied to the X and Y inputs of the NAND latch shown in the figure in the sequence indicated below:

$$X = 0, Y = 1; \quad X = 0, Y = 0; \quad X = 1, Y = 1.$$

The corresponding stable P , Q outputs will be

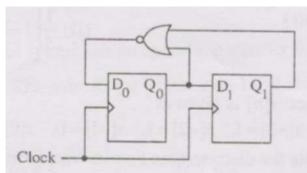


- | | | |
|--------------------|-----------------------------------|----------------------------------|
| A. $P = 1, Q = 0;$ | $P = 1, Q = 0;$ | $P = 1, Q = 0$ or $P = 0, Q = 1$ |
| B. $P = 1, Q = 0;$ | $P = 0, Q = 1$ or $P = 0, Q = 1;$ | $P = 0, Q = 1$ |
| C. $P = 1, Q = 0;$ | $P = 1, Q = 1;$ | $P = 1, Q = 0$ or $P = 0, Q = 1$ |
| D. $P = 1, Q = 0;$ | $P = 1, Q = 1;$ | $P = 1, Q = 1$ |

Your Answer: C Correct Answer: C [Correct](#) [Discuss](#)

Q #39 [Multiple Choice Type](#) [Award: 2](#) [Penalty: 0.67](#) [Digital Logic](#)

For the circuit shown, the counter state $(Q_1 Q_0)$ follows the sequence



- A. 00, 01, 10, 11, 00, ...
- B. 00, 01, 10, 00, 01, ...
- C. 00, 01, 11, 00, 01, ...
- D. 00, 10, 11, 00, 10, ...

Your Answer: B Correct Answer: B [Correct](#) [Discuss](#)

Q #40 [Multiple Select Type](#) [Award: 2](#) [Penalty: 0](#) [Databases](#)

Two more exotic relational algebra operators are the semijoin (\ltimes) and antijoin (\triangleright). Semijoin is the same as natural join, except only attributes of the first relation are returned in the result. For example, if we have relations **Student**(ID, name) and **Enrolled**(ID, course), and not all students are enrolled in courses, then the query "Student \ltimes Enrolled" returns the ID and name of all students who are enrolled in at least one course. In the general case, $E_1 \ltimes E_2$ returns all tuples in the result of expression E_1 such that there is at least one tuple in the result of E_2 with matching values for the shared attributes. antijoin is the converse: $E_1 \triangleright E_2$ returns all tuples in the result of expression E_1 such that there are no tuples in the result of E_2 with matching values for the shared attributes. For example, the query "Student \triangleright Enrolled" returns the ID and name of all students who are not enrolled in any courses.

Which of the following is/are True?

- A. $E_1 \ltimes E_2 = \pi_{\text{schema}(E_1)}(E_1 \bowtie E_2)$
- B. $E_1 \triangleright E_2 = E_1 - \pi_{\text{schema}(E_1)}(E_1 \bowtie E_2)$
- C. $(E_1 \triangleright E_2) \cup (E_1 \ltimes E_2) = E_1$
- D. $(E_1 \triangleright E_2) \bowtie (E_1 \ltimes E_2) = E_1$

Your Answer: Correct Answer: A;B;C Not Attempted Discuss

Q #41 Numerical Type Award: 2 Penalty: 0 Databases

B^+ -trees have different structures for leaf and non-leaf nodes. In B^+ -tree leaf node contains keys and record pointer associated with it and a block pointer pointing to the next leaf node. Non-leaf nodes contains only keys and child pointer, there is no need to store record pointer at non-leaf node, because all keys are ultimately present on leaf node. For leaf node order will be maximum number of keys, record pointer pair a node can hold, but order of non leaf node is determined by maximum child pointers it can have. A B^+ -tree index is to be built on the Name attribute of the relation STUDENT. Assume that all student names are of length 8 bytes, disk blocks are of size 512 bytes, and index pointers, record pointers are of size 4 bytes, 5 bytes respectively. Given this scenario, the best choice for the order of leaf node and non-leaf node is X, Y respectively. Then what is Y - X ?

Your Answer: Correct Answer: 4 Not Attempted Discuss

Q #42 Multiple Select Type Award: 2 Penalty: 0 Databases

Which of the following are true in relational algebra :

- A. For any database relation R and predicates p, q, we have

$$\sigma_{p \wedge q}(R) = \sigma_p(\sigma_q(R))$$

- B. selection is commutative, that is,

$$\sigma_p(\sigma_q(R)) = \sigma_q(\sigma_p(R))$$

- C. For any subsets a and b of a database relation R such that $a \subseteq b$, we have

$$\pi_a(R) = \pi_a(\pi_b(R))$$

- D. For any subset "a" of the attributes of a database relation R, and any predicate p only on "a", we have

$$\pi_a(\sigma_p(R)) = \sigma_p(\pi_a(R))$$

Your Answer: A;B;C Correct Answer: A;B;C;D Incorrect Discuss

Q #43 Numerical Type Award: 2 Penalty: 0 Databases

Consider the following example query over the relations M(P,Q) and N(P, R) :

```
SELECT N.P FROM N
WHERE N.R = (SELECT COUNT(M.Q)
FROM M
WHERE M.P=N.P);
```

For the following instances of relations M, N, what will be the number of tuples in the output of the given SQL query?

M

P	Q
1	2
1	3
2	2
2	5
3	4

N

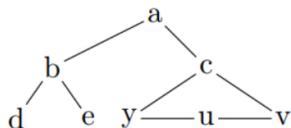
P	R
5	0
0	5
0	0
1	3
2	3
3	1

Q #44 Numerical Type Award: 2 Penalty: 0 Combinatory

A message is a sequence of two types of signals: of type A which last for 1 second and of type B which last for 2 seconds. E.g., the message ABAAB lasts 7 seconds. How many different messages last 10 seconds?

Q #45 Multiple Choice Type Award: 2 Penalty: 0.67 Graph Theory

In how many ways can we color the following graph G with three colors such that no two adjacent vertices are assigned the same color?



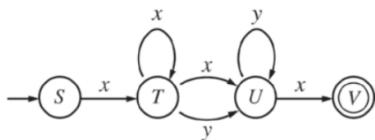
- A. 0
- B. 288
- C. 336
- D. 6561

Q #46 Numerical Type Award: 2 Penalty: 0 CO and Architecture

Consider an unpipelined processor. Assume that it has 1-ns clock cycle and that it uses 4 cycles for ALU operations and 5 cycles for branches and 4 cycles for memory operations. Assume that the relative frequencies of these operations are 50%, 35% and 15% respectively. Suppose that due to clock skew and set up, pipelining the processor adds 0.15 ns of overhead to the clock. Ignoring any latency impact, how much speed up in the instruction execution rate will we gain from a pipeline?

Q #47 Multiple Choice Type Award: 2 Penalty: 0.67 Theory of Computation

Consider the following non-deterministic finite state automaton over alphabet $\{x, y\}$ with start state S.



Which of the following grammars over alphabet $\{x, y\}$ generates the language recognized by the automaton above?

- $S \rightarrow xT$
- $T \rightarrow xT \mid xU \mid yU$
- A. $U \rightarrow yU \mid xV$
- $S \rightarrow xT$
- B. $T \rightarrow xT \mid xU \mid yU$
- $U \rightarrow yU \mid x$
- $S \rightarrow xT$
- C. $T \rightarrow xT \mid xU \mid yU \mid T \mid U$
- $U \rightarrow yU \mid xV \mid V \mid x$
- $S \rightarrow xV$
- D. $T \rightarrow xT \mid yU$
- $U \rightarrow yU \mid xV$

Q #48

Multiple Select Type

Award: 2

Penalty: 0

Theory of Computation

Consider the following language:

$$L = \{ "M": M \text{ is a TM, } M \text{ halts on the input 0 and } M \text{ doesn't halt on the input 1} \}.$$

Which of the following is true?

- A. Both L and complement of L are recognizable.
- B. L is RE but complement of L is Not RE.
- C. L is Not RE but complement of L is RE.
- D. Neither L nor complement of L is RE.

Your Answer: D

Correct Answer: D

Correct

Discuss

Q #49

Multiple Select Type

Award: 2

Penalty: 0

Theory of Computation

Which of the following is/are True?

- A. A countable union of countable sets is countable.
- B. If set T is countable, then the set {S | S ⊆ T, S is finite} is also countable.
- C. The intersection of two uncountable sets can be countably infinite.
- D. The difference T/S of an uncountable set(T) and a countable set(S) is uncountable.

Your Answer: A:B:C:D

Correct Answer: A:B:C:D

Correct

Discuss

Q #50

Multiple Choice Type

Award: 2

Penalty: 0.67

Compiler Design

If the expression $((2 + 3) * 4 + 5 * (6 + 7) * 8) + 9$ is evaluated with * having precedence over +, then the value obtained is the same as the value of which of the following prefix expressions? A. + + * + 234 * 5 + 6789 B. + * + + 234 * 5 + 6789 C. * + + 234 * 5 + + 6789 D. * + + + 234 * 5 + 6789

Your Answer: A

Correct Answer: A

Correct

Discuss

Q #51

Multiple Select Type

Award: 2

Penalty: 0

Compiler Design

Our lexer algorithm does the following: When using regular expressions to scan an input, we resolve conflicts by taking the largest possible match at any point.

Consider the following two scanners, for each scanner, we have given tokens and their associated regular expressions (Regular expression followed by Token name in the curly braces).

Scanner 1:

```
a { return A ; }
aba { return B ; }
bab { return C ; }
```

Scanner 2:

```
b { return A ; }
aba { return B ; }
bab { return C ; }
```

For which of the (scanner, string) pair, our usual lexer algorithm, taking the largest match at every step, will fail to break the string in a way in which each piece matches one of the regular expressions.

- A. (Scanner 1, abab)
- B. (Scanner 1, baba)
- C. (Scanner 2, abab)
- D. (Scanner 2, baba)

Your Answer:

Correct Answer: A:D

Not Attempted

Discuss

Q #52

Multiple Choice Type

Award: 2

Penalty: 0.67

Operating System

The page table is moved to the main memory and accessed via a TLB. Each main memory access takes 50 ns and each TLB access takes 10 ns. Each virtual memory access involves:

- mapping VPN to PPN using TLB (10 ns)
- if TLB miss: mapping VPN to PPN using page map in main memory (50 ns)
- accessing main memory at appropriate physical address (50 ns)

Assuming no page faults (i.e. all virtual memory is resident) what TLB hit rate is required for an average virtual memory access time of 61 ns.

- A. 0.98
- B. 0.95
- C. 0.96
- D. 0.90

Your Answer: Correct Answer: A Not Attempted Discuss

Q #53 Multiple Choice Type Award: 2 Penalty: 0.67 Probability

Let $X_i, 1 \leq i \leq 4$ be independent Bernoulli random variable each with mean $p = 0.1$.

Let $X = \sum_{i=1}^4 X_i$. That is, X is a Binomial random variable with parameters $n = 4$ and $p = 0.1$. Then,

- A. $P(X_1 = 1 | X = 2) = 0.1$
- B. $P(X_1 = 1 | X = 2) = 0.5$
- C. $P(X_1 = 1 | X = 2) = 0.25$
- D. $P(X_1 = 1 | X = 2) = 0.6$

Your Answer: B Correct Answer: B Discuss

Q #54 Multiple Choice Type Award: 2 Penalty: 0.67 CO and Architecture

Consider the following program segment:

```
if A > B then
    V[i] := F(i)
else
    if B > C then
        5.      V[i] := G(i)
```

Assume that the values of the Boolean expressions “ $A > B$ ” and “ $B > C$ ” are independent and that, on the average, $A > B$, 75 percent of the time and $B > C$, 25 percent of the time. If the program segment above is executed 10,000 times, how many times would one expect the functions F and G to be executed?

- A. $F : 2,500, G : 18,750$
- B. $F : 7,500, G : 625$
- C. $F : 7,500, G : 1,875$
- D. $F : 7,500, G : 2,500$

Your Answer: B Correct Answer: B Discuss

Q #55 Multiple Choice Type Award: 2 Penalty: 0.67 CO and Architecture

In a computer with a cache memory interposed between the processor and the primary memory, the cache is k -way set-associative (for some fixed k); i.e., each location in primary memory “maps to” (can be cached in) any of k locations in the cache. Let there be P locations in primary memory and C locations in the cache.

On the average, how many different locations in the primary memory map to a particular location in the cache if $k = 2$?

- A. 1
- B. 2
- C. P / C
- D. $2 P / C$

Your Answer: Correct Answer: D Not Attempted Discuss

You're doing good, you can target above 80 percentage!